

CLAIMS:

1. Apparatus for selectively providing fluid communication between the interior of a downhole assembly and the exterior thereof, said apparatus comprising: a body incorporating a wall provided with at least one aperture extending therethrough; a piston having a longitudinal bore extending therethrough and being slidably mounted in the body so as to be movable between a first position relative to the body preventing fluid communication between the bore of the piston and the exterior of the body via the or each aperture and a second position relative to the body permitting fluid communication between the bore of the piston and the exterior of the body via the or each aperture; and controlling means for controlling the movement of the piston between the first and second positions, the controlling means comprising: a control member slidable in the body and movable by fluid pressure in the body in a first axial direction relative to the body; a spring biasing the control member in an opposite axial direction of the body; a pin secured to one of the body and the control member; and a control groove in which a portion of the pin is received formed in the other of the body and the control member, the control groove being shaped to limit axial displacement of the control member generated by pressure variations in the body such that only after a predetermined number of movements of the control member to a first axial position is the control member able to move to a second axial position so as to displace the piston from one of the first and second piston positions to the other of the first and second piston positions; wherein the controlling means further comprises a first element connected to the control member so as to prevent relative rotation between the first element and the control member, and a second element connected to the body so as to prevent relative rotation between the second element and the body, wherein the arrangement of said elements is such that, in the first axial position of the control member, the first and second elements normally abut one another so as to resist axial movement of the control member toward the second axial position, said elements locating offset relative to one another so as to allow movement of the control member to the second axial position only after a predetermined number of movements of the control member to the first axial position; and wherein the spring is located in a chamber defined between the control member and the body; and at least one vent

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opening is provided in the body for venting fluid located in the chamber to the exterior of the body.

2. Apparatus as claimed in claim 1, wherein at least one vent opening is provided in the control member for venting fluid located in the chamber to the exterior of the body.

3. Apparatus as claimed in claim 2, wherein the or each vent opening in the control member is occluded so as to prevent a passage of fluid therethrough.

4. Apparatus as claimed in any of the preceding claims, wherein the arrangement of said elements is such that, as the control member moves from said first axial position to said second axial position, increasing lengths of said elements locate adjacent one another so as to provide resistance to relative rotation, in at least one direction, of the control member and body, said relative rotation being relative rotation which presses the control pin against the control groove.

5. Apparatus as claimed in any of the preceding claims, wherein said first element remains axially spaced from said second element until the control member is axially moved to the first axial position.

6. Apparatus as claimed in any of the preceding claims, wherein the arrangement of the first and second elements is such that, when said elements are offset, the control pin is received in one of a plurality of portions of control groove allowing the control member to move to the second axial position.

7. Apparatus as claimed in any of the preceding claims, wherein the arrangement of the first and second elements is such that, when said elements are offset, the control pin is received in a portion of control groove allowing the control member either to displace the piston in said first axial direction from the first piston position to the second piston position and then to a third piston position preventing fluid communication between the bore of the piston and the exterior of the body via

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the or each aperture, or to displace the piston in said first axial direction from the second piston position to the first piston position and then to a third piston position permitting fluid communication between the bore of the piston and the exterior of the body via the or each aperture.

8. Apparatus as claimed in claim 7, wherein the control groove comprises a plurality of said portions allowing displacement of the piston to said third piston position.

9. Apparatus as claimed in any of the preceding claims, wherein movement of the control member in said first axial direction past the second axial position is prevented by means of an abutment of the second element with the control member or a component connected thereto.

10. Apparatus as claimed in claim 9, wherein the second element is releasably connected to the body.

11. Apparatus as claimed in claim 10, wherein the second element is releasably connected to the body by means of a shear pin.

12. Apparatus as claimed in any one of the preceding claims, wherein, when in the second piston position, the piston is located so as to seal a fluid pathway through the apparatus and thereby, in use, direct fluid flowing into said apparatus through the or each aperture.

13. Apparatus as claimed in any one of the preceding claims, wherein the or each aperture extending through the body wall is arranged so that wellbore fluid flowing in use through the or each aperture from the interior of the apparatus is directed in a direction having a component parallel to the longitudinal axis of the apparatus.